Title: Disruptive Technologies for Data Fusion

Organizers:
James Llinas, University at Buffalo, USA
Subrata Das, Machine Analytics, Inc., USA

Abstract:
Anywhere between twenty and a hundred billion physical objects and devices are expected to be interconnected via internet by 2020. These devices will be spewing large volumes of raw and processed sensor data at a rapid pace providing the basis for obtaining actionable insights. This situation also obtains in specialized and secure networks such as intelligence and military networks that inherit the same challenging environment. But the volume, veracity, and velocity, the three major aspects that typically characterize a big data environment, pose significant challenges in searching, processing, associating, and extracting intelligence for strategic situational awareness and decision support. The need for disruptive technologies and new paradigms is therefore paramount for formulating and solving data science and associated system engineering problems in an interconnected environment. In spite of the reemergence of deep learning and artificial intelligence (AI) technologies, even current capabilities have hit the wall in terms of scalability and practicality. This special session will focus on disruptive technologies for data fusion and analytics (two sides of the same coin!) to process big centralized data, inherently distributed data, and data residing on the cloud.

Title: Assessing the Impacts of Artificial Intelligence and Machine Learning Technologies

Organizers:
James Llinas, University at Buffalo, USA
Ranjeev Mittu, Naval Research Laboratory, USA

Abstract:
Recent scientific and technical development in the fields of AI and ML, loosely inspired by the densely interconnected neurons of the brain, mimic human learning by changing the strength of simulated neural connections on the basis of experience. Systems like Google Brain and the similar systems at Stanford's Artificial Intelligence Laboratory in California have enabled impressive capabilities for what has come to be called "deep-learning", enabling computers to search for potential drug candidates, map real neural networks in the brain, or predict the functions of proteins. Geoffrey Hinton and a team of the University of Toronto in Canada tackled the difficult but commercially important task of speech recognition and broke the record for accuracy in turning the spoken word into typed text, a record that had not shifted much in a decade-so clearly there has been promise. But there are other viewpoints on all this. For example, Wagstaff argues along pragmatic lines that "Quantitative improvements in performance are rarely accompanied by an assessment of whether those gains matter to the world outside of machine learning research." Henderson et al (of McGill University in Canada) suggest a systems engineering-type deficiency, commenting that "Without significance metrics and tighter standardization of experimental reporting, it is difficult to determine whether improvements over

the prior state-of-the-art are meaningful." Further, based on published papers, there is also a question of how AI and Ml intersect with and whether they have possible synergy with the methods of Information Fusion. We have sampled the IEEE and SPIE databases (of millions of documents) and have seen single-digit numbers of papers addressing such possible overlaps. This Special Session is directed to solicitation of papers across this spectrum of topics-the promise-the pragmatic-the systemic-aspects of AI and ML, as well as the important issue to this community of the intersection of AI/Ml and IF.

Title: Evaluation of Technologies for Uncertainty Reasoning

Organizers:
Paulo C.G. Costa, George Mason University, USA
Kathryn Laskey, George Mason University, USA
Anne-Laure Jousselme, NATO STO CMRE, La Spezia, Italy
Erik Blasch, Air Force Research Lab, USA
Juergen Ziegler, IABG, Ottobrunn, Germany
Valentina Dragos, ONERA, France
Johan P de Villiers, University of Pretoria & CSIR, South Africa
Claire Laudy, THALES Research & Technology France, France

Abstract:
This session is intended to report the latest results of the ISIF's ETURWG, which aims to bring together advances and developments in the area of evaluation of uncertainty representation. The ETUR special session series started in Fusion 2010 and has been held ever since, with the exception of Fusion 2017. While most attendees consist of ETURWG participants, new researchers and practitioners interested in uncertainty evaluation have attended the sessions and some became associated with the ETURWG. The session will focus three topics: (1) to summarize the state of the art in uncertainty analysis, representation, and evaluation, (2) discussion of metrics for uncertainty representation, and (3) survey uncertainty at all levels of fusion. The impact to the ISIF community would be an organized session with a series of methods in uncertainty representation as coordinated with evaluation. The techniques discussed and questions/answers would be important for the researchers in the ISIF community; however, the bigger impact would be for the customers of information fusion systems to determine how measure, evaluate, and approve systems that assess the situation beyond Level 1 fusion.

Title: Information Fusion in Multi-Biometrics and Forensics

Organizers:
Naser Damer, Fraunhofer Institute for Computer Graphics Research (IGD), Germany
Raghavendra Ramachandra, Norwegian University of Science and Technology (NTNU), Norway
Kiran B. Raja, Norwegian University of Science and Technology (NTNU), Norway

Abstract:
This session will focus on the latest innovations and best practices in the emerging field of multi-biometric fusion. Biometrics tries to build an identity recognition decision based on the physical or behavioral characteristics of individuals. Multi-biometrics aims at outperforming the conventional biometric solutions by increasing accuracy, and robustness to intra-person variations and to noisy data. It also reduces the effect of the non-universality of biometric modalities and the vulnerability to spoof attacks. Fusion is performed to build a unified biometric decision based on the information collected from different biometric sources. This unified result must be constructed in a way that guarantees the best performance possible and take into account the efficiency of the solution. The topic of this special session, Information Fusion in Multi-Biometrics and Forensics, requires the development of innovative and diverse solutions. Those solutions must take into account the nature of biometric information sources as well as the level of fusion suitable for the application in hand. The fused information may include more general and non-biometric information such as the estimated age of the individual or the environment of the background.

Title: Applications of Data Analytics and Information Fusion to Finance, Business, Marketing, and Risk Management

Organizers:
Kuochu Chang, George Mason University, USA
Ran Ji, George Mason University, USA
Sabyasachi Guharay, George Mason University & US Internal Revenue Service, USA

Abstract:
This session will focus on applying data fusion and predictive analytics to finance, business, quantitative risk management, and marketing. Finance, risk management, and business are critical application areas in information fusion and data analytics. Many of the techniques discussed in the information fusion community are directly applicable to this emerging and important application area. The goal of this proposed session is to open up a forum for data scientists and engineers to share their latest experience and insight on applying the predictive modeling and data analytics techniques to the applications. In addition, practitioners in this field can share some of their insights from their study of the "big data" in these areas.

Title: Advanced Nonlinear State Estimation

Organizers:
Jindřich Duník, University of West Bohemia & Honeywell International, Czech Republic
Ondřej Straka, University of West Bohemia, Czech Republic
Uwe D. Hanebeck, Karlsruhe Institute of Technology & Karlsruhe Institute of Technology (KIT), Germany

Fred Daum, Raytheon, USA

Abstract:
Areas such as target tracking, positioning, navigation, sensor fusion, signal processing, and decision-making usually require application of nonlinear state estimation methods. The methods are used to provide an estimate of a system state, which is not often directly measurable. The development of the methods has started in the sixties with the appearance of the Kalman filter. The first methods were able to cope with linear (and often Gaussian) system models and for this purpose nonlinear system models were linearized. Satisfactory performance of these methods was limited to system models with mild nonlinearities. Advanced performance of computers made it possible to develop more and more complex methods, which were able to cope even with strongly nonlinear or non-Gaussian models. In contrast to the first optimisation-based methods, these modern methods focused on Bayesian approach to state estimation, which allowed a more informative description of the estimate by the probability distribution. These modern methods were subsequently advanced to increase their efficiency, reduce their requirements and assumptions, and to allow application in more general settings. This special session focuses on recent advances in nonlinear state estimation for both discrete and continuous time system models with areas such as sigma-point filtering, Gaussian filters, Gaussian-mixture filters, non-Gaussian filters such as Student's-t filters, point-mass and particle filters and smoothers, homotopy-based estimation methods for continuous and discrete densities, state estimation with partially unknown model, comparisons of existing nonlinear filtering methods, applications of nonlinear state estimation methods.

Title: Decentralized Multi-target Detection, Estimation, and Control for UAV Networks

Organizers:

Donald Bucci, Lockheed Martin Advanced Technology Laboratories, USA
Pramod Varshney, Syracuse University, USA

Abstract:
Recent advances in commercial off-the-shelf (COTS) unmanned aerial vehicles (UAV) alongside low size, weight, power, and cost (SWaP-C) sensing payloads have generated renewed interest in decentralized detection and estimation theory applications in non-traditional operational environments. For example, a decentralized multi-target tracking system with many mobile micro-UAV sensors has the capability to provide significant situational awareness in urbanized environments while maintaining cost scalability and robustness to component failure. Systems in this context, due to their projected size and maneuverability, achieve this situational awareness by quickly and autonomously moving through highly obstructed areas while maintaining sensor coverage across the region. In the multi-target tracking community, these problems are typically addressed in the field of sensor control (e.g., selecting agent headings and deployments that maximize tracking accuracy on potential targets). However, the current state of the art in sensor control for such decentralized techniques focus on the tractable evaluation of the control policy over a finite horizon rather than the accuracy of the action space (e.g., simplistic first/second

order integrator dynamics) and the uncertainty present in the environment (e.g., exact locations of the obstacles). As a result, critical constraints on safe flight operation such as inter-agent and obstacle collision avoidance have received considerably less attention, especially when viewed in the context of what is actually achievable by the platform at higher speeds and more complex maneuvers. This session will thus focus on addressing how state-of-the-art techniques in areas such as robotics and control theory can be used to augment and improve sensor control approaches in decentralized detection and estimation theory. More broadly, this session will cover integrated and component technologies involving receding horizon control for practical UAV platforms (e.g., quadcopters), collision-avoidance guarantees, and robustness to environmental uncertainty as they apply to the sensor control problem with mobile agents. This session will also solicit contributions from relevant bandwidth-constrained application areas such as decentralized multi-target tracking or event detection.

Title: Multisensor Data Fusion Algorithms for Industry 4.0

Organizers:
Claudio M. Farias, Universidade Federal do Rio de Janeiro, Brazil
Igor L Dos Santos, Universidade Federal do Rio de Janeiro, Brazil
Manoel Saisse, National Institute of Technology, Brazil

Abstract:
This special session aims to explore the use of data fusion algorithms in the emerging Industry 4.0 scenario. The Internet of Things (IoT) is a novel paradigm that is grounded on Information and Communication Technologies (ICT). Recently, the use of IoT has been gaining attraction in areas such as logistics, manufacturing, retailing, and pharmaceutics, transforming the typical industrial spaces into Smart Spaces. This leads to a novel paradigm called Industry 4.0. Since IoT data is usually dynamic and heterogeneous, it becomes important to investigate techniques for understanding and resolving issues about data fusion in Industry 4.0. Employment of Data fusion algorithms are useful to reveal trends in the sampled data, uncover new patterns of monitored variables, make predictions, thus improving decision making process, reducing decisions response times, and enabling more intelligent and immediate situation awareness.

Title: Information Fusion from Disparate Data Sources

Organizers:
Pramod Varshney, Syracuse University, USA
Muralidhar Rangaswamy, AFRL, USA

Abstract:
In the recent past, situation awareness information has largely been derived from single-modality sensors (e.g. radar, electro-optic cameras). Currently, however, multi-modality sensors are increasingly being used to monitor phenomena of interest (PoI) including from humans to

generate diverse and richer information about the PoI. This motivates the need for automated fusion methods, which can process the enormous volume of structured and unstructured data which could provide improved situational awareness for various tasks, such as target/object detection and tracking, detection of deception and security threats, and surveillance of patterns. Applications of these techniques include defense, financial, health, sports, medical, and bio sectors. This session will focus on methods to fuse data from disparate sources to enable better situation awareness.

Title: Emerging Methods for Anomaly Detection

Organizers:
Syed Mohsen Naqvi, Newcastle University, United Kingdom
Lyudmila Mihaylova, University of Sheffield, United Kingdom

Abstract:
Sensors provide enormous amounts of data - for surveillance, medical purposes, intelligent transport, agriculture and many other areas. CCTV cameras are widely deployed in public and private and can operate simultaneously with infrared thermal sensors, e.g. for robust action recognition, tracking for human behaviour analysis and anomaly detection as part of the next generation of autonomous systems. Detecting autonomously hidden patterns of behaviour is a very challenging problem and enormous efforts are devoted on it. This special session calls for theoretical and practical works in the domain of human anomaly detection. The call is open to everybody working in the area. Results from the current and recently funded projects by Thales and or EPSRC U.K. "Multimodal Wide Area Surveillance" and "Signal Processing Solutions for the Networked Battlespace" are also solicited for participation.

Title: Multisensor Heterogeneous Data and Information Fusion

Organizers:
Yaakov Bar-Shalom, University of Connecticut, USA
Kuochu Chang, George Mason University, USA

Abstract:
The types of heterogeneous source fusion to be covered by this session are: 1. Sensors with different an imperfectly known time references 2. Sonar and radar 3. General asynchronous heterogeneous sensors with estimates in different state spaces 4. Acoustic and ESM/EO sensors 5. Fusion of IMM estimator tracks whose model details are unknown to the fusion center with measurements from another sensor using the cumulated information concept 6. Track-to-Track fusion with cross-covariances from radar and EO/IR sensor.

Title: Advances in Distributed Kalman Filtering and Fusion

Organizers:
Benjamin Noack, Karlsruhe Institute of Technology (KIT), Germany
Susanne Radtke, Karlsruhe Institute of Technology, Germany
Felix Govaers, Fraunhofer FKIE / University of Bonn, Germany

Abstract:
The rapid advances in sensor and communication technologies are accompanied by an increasing demand for distributed state estimation methods. Centralized implementations of the Kalman filter are often too costly in terms of communication bandwidth or simply inapplicable - for instance when mobile ad-hoc networks are considered. Compared with centralized approaches, distributed or decentralized Kalman filtering is considerably more elaborate. In particular, the treatment of dependent information shared by different systems is a key issue. Distributed state estimation is, in general, a balancing act between estimation quality and flexible network design. Although distributed implementations of the Kalman filter that provide optimal estimates are possible, these algorithms are not robust to packet delays and drops, node failures, and changing network topologies. In practice, these problems deserve careful attention and have to be addressed by future research.

Title: Directional Estimation

Organizers:
Florian Pfaff, Karlsruhe Institute of Technology (KIT), Germany
Kailai Li, Kalsruhe Institute of Technology(KIT), Germany
Uwe D. Hanebeck, Karlsruhe Institute of Technology & Karlsruhe Institute of Technology (KIT), Germany

Abstract:
Many estimation problems of practical relevance include the problem of estimating directional quantities, for example, angular values or orientations. However, conventional filters like the Kalman filter assume Gaussian distributions defined on R^n. This assumption neglects the inherent periodicity present in directional quantities. Consequently, more sophisticated approaches are required to accurately describe the circular setting. This Special Session addresses fundamental techniques, recent developments, and future research directions in the field of estimation involving directional and periodic data. It is our goal to bridge the gap between theoreticians and practitioners. Thus, we welcome both applied and theoretic contributions to this topic.

Title: Sensor Fusion for Autonomous Driving

Organizers:
Ting Yuan, Mercedes-Benz R&D, USA
Bharanidhar Duraisamy, Daimler AG, Germany

Abstract:
Autonomous driving poses unique challenges for vehicle sensor fusion system in complicated driving environments. In 2009, Google first announced an initiative to develop self-driving cars. Since then their autonomous driving vehicles have already covered more than two million miles, and every day their simulators drive three million more. By Oct 2016, 19 companies has announced plans for AVs to be available in the next three to five years. According to a recent study released by Intel (http://fortune.com/2017/06/03/autonomous-vehicles-market/), there will be a $7 trillion self-driving future by 2050. The rapid progress of the self-driving vehicle development demands a workforce that is well prepared for the technology. This brings exciting opportunity for our international society of information fusion - the vehicle sensor fusion system is now widely considered as the most important component in the autonomous driving system and a bottleneck technology to achieve SAE level 4/5 autonomous driving system. The special session is intended to inspire sensor fusion researchers/engineers to apply the corresponding theories/knowledge to push forward the autonomous driving to a higher level in the following major aspects: 1) Automotive Sensor fusion systems. 2) Automotive Sensor Fusion technology in North America/Europe/Asian. 3) Automotive high-resolution Radar/Lidar/Camera Perception systems. 4) AI-based Sensor Fusion Systems. 5) V2X based Sensor Fusion Systems. 6) Performance analysis for automotive Sensor Fusion Systems. 7) Extended object tracking for vulnerable road users.

Title: Extended Object and Group Tracking

Organizers:
Marcus Baum, University of Goettingen, Germany
Karl Granström, Chalmers University of Technology, Sweden
Uwe D. Hanebeck, Karlsruhe Institute of Technology & Karlsruhe Institute of Technology (KIT), Germany
Wolfgang Koch, Fraunhofer FKIE & University of Bonn, Germany
Peter Willett, University of Connecticut, USA

Abstract:
Traditional object tracking algorithms assume that the target object can be modeled as a single point without a spatial extent. However, there are many scenarios in which this assumption is not justified. For example, when the resolution of the sensor device is higher than the spatial extent of the object, a varying number of measurements from spatially distributed reflection centers is received. Furthermore, a collectively moving group of point objects can be seen as a single extended object because of the interdependency of the group members. This Special Session addresses fundamental techniques, recent developments and future research directions in the field of extended object and group tracking.

Title: Advances in Motion Estimation Using Inertial Sensors

Organizers:
Manon Kok, Delft University of Technology, The Netherlands
Gustaf Hendeby, Linköping University, Sweden

Abstract:
Accelerometers and gyroscopes (inertial sensors) measure the movement of the sensor in terms of its acceleration and angular velocity. These sensors are nowadays not only widely available in smartphones and VR / AR headsets but also in dedicated sensor units (inertial measurement units). Due to their small sizes, they can non-intrusively be placed on people and in devices. Measurements from mobile sensors carried by or placed on people, vehicles, and robots can be used to track or classify their movements. Due to technological advances, the availability of these sensors as well as their accuracy has steadily increased over recent years, opening up for many exciting applications. Since inertial measurements only give accurate position and orientation information on a short time scale, inertial sensors are typically combined with other sources of information, e.g., additional sensors or with motion models. Challenges lie both in obtaining accurate (sensor and motion) models as well as in the choice and development of algorithms. This special session features contributions describing recent developments in the use of inertial sensors, with focus on localisation, calibration and biomedical applications.

Title: Cognitive and Computational Methods for Situation Management

Organizers:
Galina L. Rogova, University at Buffalo, USA
Kellyn Rein, Fraunhofer FKIE, Germany

Abstract:
Situation management is a collection of methods and tools aimed at helping decision makers to monitor, understand and control dynamic situations, and act effectively to mitigate their negative impact. Situation management problems exist in many domains such as traditional and asymmetric warfare, man-made and natural disasters, network management, border and harbor protection, and transportation. To understand and effectively respond to the developing dynamic situation, decision makers must quickly process heterogeneous information which may be uncertain, ambiguous, of varying reliability and situational significance which is flowing in from numerous observers and responders as well as sensors of various types and characteristics. This flood of information must be analyzed as effectively and accurately as possible to produce coherent current and predicted (future) situational pictures to support the decision maker's Situation Awareness. A key enabling technology for effective information exploitation is information fusion, which combines incoming information from myriad sources to build a current situational picture, and to predict potential future consequences of that picture.

Title: Situational Understanding Through Equivocal Sources

Organizers:
Lance Kaplan, US Army Research Laboratory, USA
Murat Sensoy, University of Aberdeen, United Kingdom
Geeth Ranmal de Mel, IBM Research, United Kingdom
Tien Pham, US Army Research Laboratory, USA

Abstract:
In contrast to traditional sensing sources, the proliferation of soft information sources - especially multimodal social media - has made them a viable medium to obtain insights about events and their evolutions in the environment. Furthermore, advances in machine learning have enabled richer semantic information to be extracted from traditional sensing, but when limited training data is available, the veracity of such information can be unreliable. Fusing semantic information from soft and traditional sensing sources using emerging artificial intelligence and machine learning techniques could improve the situational understanding of decision-makers, thus enabling them to make informed decisions in rapidly changing complex environments. However, the equivocal nature of such sources and the information extraction process itself makes the decision-making challenging, especially in critical situations where information reliability plays a key role. Thus, the aim of the special session is as follows: (a) discuss how different strains of information can be processed, analysed, and combined to model the equivocality in information; (b) investigate how such models can be exploited to improve the credibility and reliability of the fused information; and (c) frameworks to combine such information to assists decision makers-be they central or edge users.

Title: Context-based Information Fusion

Organizers:
Jesus Garcia, Universidad Carlos III de Madrid, Spain
Lauro Snidaro, University of Udine, Italy
Ingrid Visentini, EUVISIA, Italy
Jose Manuel Molina, Universidad Carlos III de Madrid, Spain

Abstract:
The goal of the proposed session is discussing approaches to context-based information fusion. It will cover the design and development of information fusion solutions integrating sensor data with contextual knowledge. The development of IF systems inclusive of contextual factors and information offers an opportunity to improve the quality of the fused output, provide solutions adapted to the application requirements, and enhance tailored responses to user queries. Contextual-based strategy challenges include selecting the appropriate representations, exploitations, and instantiations. Context could be represented as knowledge-bases, ontologies,

and geographical maps, etc. and would form a powerful tool to favor adaptability and system performance. Example applications include context-aided tracking and classification, situational reasoning, ontology building and updating. Therefore, the session covers both representation and exploitation mechanisms so that contextual knowledge can be efficiently integrated in the fusion process and enable adaptation mechanisms.

Title: Internet of Battlefield Things

Organizers:
Tarek Abdelzaher, University of Illinois, Urbana Champaign, USA
Stephen Russell, United States Army Research Laboratory, USA

Abstract:
Recent directions in military thinking support the development of new intelligent system technologies for delivery and exploitation of battlefield services. Such dynamically composed systems, a so-called Internet of Battlefield Things (IoBT)1, may revolutionize smart battlefields of the future, in the same way the Internet of Things revolutionized smart homes, cities, and civilian services (e.g., transportation, agriculture, and energy management). The development of effective IoBTs, however, poses significant challenges. Unlike civilian IoTs, IoBTs will usually operate in contested adversarial environments and will need to support diverse missions, tasks, and goals. They will include highly heterogeneous nodes, from humans to high-energy weapons and from cloud services to embedded resource-limited devices. IoBTs will carry sensitive battlefield information and execute mission-critical software, where protecting information flow in a robust manner from failures, attacks, and outages, becomes a paramount concern. Improving the quality of information delivery and usage in the face of disruptions becomes an important consideration. This session discusses the challenges that emerge in information flow management and subsequent decision-making in the context of the envisioned IoBTs, and solicits emerging research on potential solutions. The work presented in this session will contribute new data fusion solutions that are geared for untrusted (grey) or adversarial (red) contexts, where data may be manipulated, delayed, or maliciously altered, and where devices may be infiltrated, disabled, or isolated. Advances will be made in dynamic composition of fusion systems to meet mission information goals, as well as in advances in machine intelligence and adaptation as they pertain to fusion pipelines in the face of unexpected disruptions and adversarial conditions. Notions of security and trust will be reassessed to offer improved foundations for delivering reliable results in unreliable, noisy, malicious, or compromised environments, manipulated by near-peer adversaries.

Title: Multi-layered Fusion Processes: Exploiting Multiple Models and Levels of Abstraction for Understanding and Sense-Making

Organizers:
Lauro Snidaro, University of Udine, Italy

Jesus Garcia, Universidad Carlos III de Madrid, Spain
Kellyn Rein, Fraunhofer FKIE, Germany

Abstract:
The exploitation of all relevant information originating from a growing mass of heterogeneous sources, both device-based (sensors, video, etc.) and human-generated (text, voice, etc.), is a key factor for the production of timely, comprehensive and most accurate description of a situation or phenomenon in order to make informed decisions. Even if exploiting multiple sources, most fusion systems are developed for combing just one type of data (e.g. positional data) in order to achieve a certain goal (e.g. accurate target tracking) without considering other relevant information (e.g. current situation status) from other abstraction levels. The result of single-layer processing is often stove-piped systems dedicated to a single fusion task with limited robustness. This is caused by the lack of an integrative approach for processing sensor data (low-level fusion) and semantically rich information (high-level fusion) in a holistic manner, thus effectively implementing a multi-layered processing architecture and fusion process. Processes at different levels generally work on data and information of different nature. For example, low level processes could deal with device-generated data (e.g. images, tracks, etc.) while high level processes might exploit human-generated knowledge (e.g. text, ontologies, etc.). The overall objective is to enhance the sense-making of the information collected from heterogeneous sources and multiple processes for improved situational awareness and intelligence. This special session will bring together researchers working on fusion techniques and algorithms often considered to be different and disjoint. The objective is thus fostering the discussion and proposing viable multi-layered fusion solutions to address challenging problems in relevant applications.

Title: Explainable AI for Information Fusion

Organizers:
Lauro Snidaro, University of Udine, Italy
Jesus Garcia, Universidad Carlos III de Madrid, Spain

Abstract:
Currently, development of "explainable" intelligent systems has been identified as a key area of research and a possible major step in AI. The recent DARPA "Explainable Artificial Intelligence" (XAI) program is the subject of significant funding and is expected to close by 2021. Most of current machine learning techniques are difficult to explain since their models are complex, usually of black-box type, and therefore not easily interpretable. Other classical methods are instead inherently interpretable, as is the case of rule-based systems, decision trees, causal networks, logical reasoning. The "next wave of AI" challenges should place emphasis on "explainable models" instead of "black box" paradigms. The key is providing explanations to the users about the decisions taken or proposed, especially in mission-critical applications required to facilitate human-machine interaction. While previous AI milestones have been characterized by manually crafted knowledge (expert systems) and statistical machine learning, the open challenge is focused now on learning paradigms with explainable models and context adaptation

to gain in generalization capability. Explainable AI (XAI) can benefit from recent developments in IF systems, context enhancement, and decision support systems. This special session will discuss central topics around this line of research and also the interplay and similarities with research in the development of IF systems for decision support, where the representation of the world according to a certain model should explain the decisions taken.